

servers since the year 1594, with special descriptions of the more important auroral displays and a general analysis of the reports. As it seemed likely that there would be a long delay in the publication of this important work, the summaries given by Tromholt in this preliminary communication were extremely welcome. My personal interest in the matter even led me to offer to supervise the publication in America of the original work, since the author had failed to find a publisher in Europe, but his early death closed our negotiations in this respect and it appears that his manuscript was subsequently given by his widow to his friend J. Fr. Schroeter for the purpose of publication in Norway, if possible. This desire has now been realized, and the publication at the joint expense of the Academy of Sciences at Christiania and the Fridtjof-Nansen Fund, as recommended by Professor Dr. Mohn, is a valuable addition to our knowledge of the aurora borealis.

This volume is a quarto of 422 pages of text besides the preface. In addition to the preface by Schroeter, there is also one prepared by Tromholt, from which we learn that he began the work of making this collection in 1879 and did not shrink from the great labor of examining general historical and archaeological works, public and private libraries, and the archives of about a dozen public institutions, including the university library at Leipsic. Especial attention was given to Norwegian newspapers. In all cases the complete records of details were copied. The dates are always reckoned, as in astronomy, from noon to noon; the four subdivisions of Norway are: I, north of  $68^{\circ} 30'$ ; II, between  $68^{\circ} 30'$  and  $65^{\circ}$ ; III, between  $65^{\circ}$  and  $61^{\circ} 30'$ ; IV, south of  $61^{\circ} 30'$ . The total number of stations from which observations have been gathered is 216 and the total number of sources of information referred to in the catalogue is about 300.

Under the editorship of Schroeter, the material collected by Tromholt has been judiciously sifted and apparently nothing has been published that is not a distinct addition to exact knowledge. Especially must we approve of Schroeter's good judgment as an editor in restricting the publication of detailed descriptions, partly because so many are given in the publications of the International Polar Research, 1882-83, by expert physicists that nothing more would seem to be necessary; partly because there is abundant reason to think that the same aurora presents different aspects to observers a few miles apart, so that the mass of details must be useless until we understand more about the location and origin of the phenomena.

The list of auroras (Catalogue D) begins with September 27, 1594, and ends with April 22, 1878, covering 310 pages, and giving about 9 000 observations on nearly 6 000 different auroral dates. For each date is given the age of the moon, the place and time of observation, a few words of description, and a reference to the source of information. In the second section, special descriptions are given of suspected auroras, from 1550 to 1569, and of auroras proper from 1739 to 1878. In the third section, Table A gives the monthly and annual sums of the days on which auroras were observed somewhere in Norway. The auroral year, like the snow year, is reckoned from July to June, inclusive. The annual sums are then transformed into smoothed numbers by the formula  $1/10 (a + 2b + 4c + 2d + e)$ . The annual sums are also given for each of the four sections into which the author subdivides the area of Norway. On page 352 these annual sums, from 1761 to 1878, are combined into one total, representing the monthly distribution of 5 891 days with auroras. This computation is given for each of the four subdivisions, as well as for all Norway. The monthly sums are also converted into comparable percentages by reduction to a uniform summation of 1 000, whence it appears that in the northernmost division of Norway the annual periodicity shows a maximum at the winter solstice, whereas in the southernmost section two maxima occur corresponding to the equinoxes. Therefore, in the northern

portion of Norway the annual periodicity is of the same character as in the arctic regions generally. The annual period prevailing in the southern division of Norway is similar to that found in all middle latitudes. A combination of all the records of Tromholt for Norway, and Rubenson for Sweden, is given on pages 353-414, for the years 1722, March 4, to 1878, April 22. The study of the geographical distribution of these observations shows again a maximum in January in the northern regions, and maxima about September 21 and March 21 in the southern regions.

In the third part of the volume Schroeter has presented us with a new and complete recomputation of the preliminary discussion found among the papers of Tromholt, so that the figures differ somewhat from those published by the latter in Petermann's Mittheilungen. Especially has he omitted the attempt to investigate the apparent periodicity of the aurora due to the obscuration by the varying brightness of the moon, since such an investigation can not lead to any satisfactory result, unless the cloudiness of the sky has been recorded uniformly throughout many lunar months. For the same reason the study of the annual periodicity must be omitted, but we do not at first see why a similar argument would not hold good against the investigation of the sun-spot period which Schroeter has undertaken. Notwithstanding the imperfections of his data, Schroeter concludes that the results for Norway are in general quite parallel to those deduced by Rubenson from the observations in Sweden.

It is not likely that this great work of Tromholt's, taken in conjunction with its predecessors, exhausts all accessible European records, but it goes a long way toward preparing for a renewal of the comprehensive studies of the geographical and chronological distribution of auroras that were initiated by Fritz fifty years ago.—C. A.

#### MARYLAND CLIMATOLOGY.

Dr. O. L. Fassig communicates to the Library of the Weather Bureau copies of the short paper on the climate of Cecil County, Md., just now published as a part of the volume of the Maryland Geological Survey on the Geology of Cecil County. A third pamphlet on the climate of Garrett County is now in press. A similar report on Allegheny County was published in 1900. The plan is to take up each county of the State in turn and tabulate and discuss all the meteorological observations that have been made at any time in the history of the county, but especially those made under the auspices of the Smithsonian Institution, 1848-1873, the Weather Bureau, 1870-1902, and the Maryland State Weather Service, 1896-1902. The expense of publication is met by the Maryland Geological Survey. Each climatic sketch forms a chapter in the volume on the geology of the respective counties. In this way the local peculiarities of each portion of the State will be thoroughly presented.

Cecil County is in the extreme northeast section of the State of Maryland. Its surface is most gently undulating with a general elevation of about 300 feet, but occasionally rising to 500. The tide waters of Chesapeake Bay penetrate every portion of the southern part of the county. The principal records discussed in this pamphlet are those of Woodlawn from 1865 to 1875, inclusive, at which station the maximum temperature of  $100^{\circ}$  occurred once, in July, 1868, and the minimum temperature of  $-10^{\circ}$ , also once, in January, 1873. The maximum monthly precipitation was 11.81, in August, 1874, and minimum monthly was 0.36, in October, 1875.—C. A.

#### WEATHER BUREAU MEN AS INSTRUCTORS.

Mr. J. R. Weeks, Observer, United States Weather Bureau, Macon, Ga., reports that he gave an informal lecture on the

instruments and work of the Weather Bureau to the class in physical geography of the high school in that city on November 4.

Mr. Charles Stewart, Observer, United States Weather Bureau, Spokane, Wash., reports that on March 21 he addressed the pupils of the Spokane High School, on Weather Changes and their Causes. On April 21 and 22 the pupils visited the Weather Bureau station and were instructed in the nature and use of the apparatus and in other matters connected with meteorology.

Mr. J. B. Marbury, Section Director, Atlanta, Ga., writes, as follows:

On November 13 of this year I delivered a lecture to a class at the Boys' High School in this city. My subject was "The Weather and the science of forecasting." My talk was mainly a preface to others that I have promised to give from time to time as my duties will permit. Much interest was shown in my remarks, which the teacher has since informed me made a deep impression upon his class. The increasing interest shown in the Bureau is, I think, largely due to the lectures and talks given from time to time by the various Weather Bureau officials throughout the country.

#### SAMUEL B. PFANNER.

In the death of Observer Samuel B. Pfanner, which occurred at Toledo, his native city, on November 2, 1902, the Weather Bureau sustains the loss of a faithful and efficient member of its observing force. Mr. Pfanner was born May 31, 1852. He entered the Weather Service September 2, 1890, and performed duty at Chicago, Ill., Cincinnati, Ohio, New Orleans, La., San Antonio, Tex., and Toledo, Ohio. Recently, his health failing him, his transfer to Phoenix, Ariz., was promptly arranged for at his request, but his illness took a sudden change for the worse, and he died before he could execute the official orders for his transfer which he had received.—D. J. C.

#### AUSTRALIAN DROUGHTS AND THE MOON.

Mr. H. C. Russell, Director of the Observatory at Sydney, New South Wales, has published in the Journal and Proceedings of the Royal Society of New South Wales, for the year 1901, a memoir on the relation of the moon's motion in declination and the quantity of rain in that colony, in which the author concludes "that rain is clearly shown to come in abundance when the moon is in certain degrees of her motion south; but when the moon begins to go north then droughty conditions prevail for seven or even eight years. This phenomenon repeated for three periods of nineteen years each constitutes a marvellous coincidence such that there must be a law connecting the two phenomena."

The influence of the moon on the weather is a matter that will not be downed by the exercise of any amount of common sense. According to the most ancient notions, the moon ought to have and must have a controlling influence in excess of the sun's, and every one who seeks to demonstrate its power is liable to become infatuated with the study. The moon has so many variations north and south of the equator, north and south of the ecliptic, to and from the earth, from new moon to full moon, conspiring with the sun and opposing the sun, that it does seem as though one ought to be able to make its periodical oscillations agree with some of the many variations in the aspect of the weather. However, we know of but one relation between the moon and the earth's atmosphere that can be said to have been settled upon a rational basis and that is the matter of atmospheric tides. Laplace stated that the semidiurnal lunar tide in the atmosphere ought to amount to about 0.003 inches of barometric pressure for equatorial stations, and this agrees with the results of observations carried on at Batavia, Java. His formulæ also showed, although we believe he did not state the fact, that as the moon moves north and south of the equator monthly, there ought to be a fortnightly tide, or a

general pull of the atmosphere southward for two weeks and northward for two weeks. This we believe was first demonstrated as an observable quantity by A. Poincaré, a civil engineer of Paris and a member of the Meteorological Society of France. From his articles published by that Society in 1885-1888, we learn that the average barometric pressure on parallels of latitude around the whole globe, as measured on the International Maps published by the United States Weather Bureau, give the following results: The pressure on latitude 40° minus that on latitude 10° is + 1.88 millimeters when the moon is in the extreme south and + 4.82 millimeters when the moon is in the extreme north. The normal difference is + 3.35. This indicates that when the moon is furthest north there is a slight accumulation of atmosphere in the Northern Hemisphere, amounting to an increase of 1.47 millimeter, or 0.06 inch of pressure on the parallel of 40°.

Now, all lunar phenomena go through rather rapid periodic changes. What happens in one part of a lunar month is offset by an opposite effect in the other half of that month, or what happens at the time when the sun and moon conspire is offset by an opposite effect a few months or years later when the sun and moon oppose each other. When the moon is far south and begins to go north, according to Mr. Russell, droughty conditions prevail and continue for seven or eight years. But the strange part is that the moon begins to go north from her extreme southern position every month without exception, not only just before the seven or eight year drought, but during the whole of that long period, and continues to do so during the whole of the succeeding rainy period. How can her beginning to go north be rationally supposed to be a basis for predicting droughts in one case and rains in another?

But if we lay aside all these vagaries about the moon, and recognize Mr. Russell's meteorological induction that droughty conditions do prevail for seven or eight years in Australia, followed by years of rain, and that this cycle of droughts and rains has been repeated about three times since 1840, then, we have a fair observational basis upon which to build a rational explanation. Now, this periodicity, or rather the irregular succession of good seasons and bad seasons is a fact recognized in every portion of the world. We have also enough data to show that in most cases a drought in one portion of the globe is accompanied by rains in other portions, and that the regions of excess and deficiency of rain move over the surface of the globe month by month and year and year. They do not move in courses so nearly parallel as to justify long range predictions any more than do our storm centers, but the movements are certainly governed by laws, and we can begin to generalize as a first step in the process from induction to deduction. For instance, floods in the upper Nile, due to rains in the highlands of central Africa, mean that an unusual proportion of moisture has been taken from the southeast trade wind current, and that, therefore, when that has turned northeastward over the Indian Ocean, and has become the southwest monsoon of India, it will bring droughts over the western portion of that country. A drought in New South Wales, or on the southeast side of Australia, means a deficiency in the easterly winds blowing on that coast, and especially so in the rainy season, or December, January, February, and March. But this means that the great area of high pressure over the Indian Ocean at latitude 30° south has been pushed farther west than usual, or in other words that the general circulation of the atmosphere in that region has been disturbed. Now, such a disturbance, continued over several months or even years, can hardly be produced by the rapidly changing moon; it might be due to secular changes in the quantity and quality of the solar heat, but is most of all, likely to be simply the result of accumulations of pressure, temperature, and moisture in various portions of the earth's atmosphere. Australia has about the same area as the United States, but lies on the average